

<p style="text-align: center;">ARIZONA DEPARTMENT OF AGRICULTURE</p> <p style="text-align: center;"><u>DIRECTOR'S ADMINISTRATIVE ORDER</u></p> <p style="text-align: center;">PLANT SERVICES DIVISION</p> <p style="text-align: center;">CODLING MOTH</p>	<p><u>DIVISION/</u> <u>PROGRAM</u> <u>5</u></p> <p><u>ORDER</u> <u>DAO 99-02</u></p> <p><u>S/ Sheldon R. Jones</u></p> <p><u>SIGNATURE</u> <u>4/14/99</u></p> <p><u>EFFECTIVE DATE</u></p>
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1. PURPOSE

The Department shall ensure compliance with the September 8, 1997 agreement of the Arizona Apple Growers Association and Arizona Chapter I – Organic Crop Improvement Association to minimize codling moth, *Cydia pomonella*, damage in apple orchards in Cochise and Graham Counties.

2. AUTHORITY

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| A.R.S. § 3-205 | Abatement of nuisance not imminently dangerous; procedure; lien; foreclosure; release of lien; reimbursement costs and penalties to the state for certain abatements. |
| A.R.S. § 3-205.1 | Summary abatement of noxious weeds, crop pests or diseases under preapproved programs. |
| A.R.S. § 3-208 | Hearing on Plant Menace; Evidence; Quarantine zones; Violation |

3. RESPONSIBILITY

The associate director and supervisors of the plant services division shall ensure that all employees understand and comply with this order.

4. APPLICABILITY

This order applies to all apple orchards in Cochise and Graham Counties.

5. ORDER

- A.** Definition. In addition to the definitions provided in A.R.S. § 3-201 and A.A.C. R3-4-102, the following term applies to this Section.
- “Pest” means the codling moth, *Cydia pomonella*.
- B.** Area under quarantine. Cochise and Graham Counties.

- C. Restrictions. The following practices shall be implemented in apple orchards to minimize the pest:
1. Growers shall use pheromone traps to monitor the pest.
 2. Growers shall apply pesticides with timely applications throughout the growing season and/or use mating disruption techniques, and may use A Basic Approach to Codling Moth Control, by G.T. Bohmfalk, Phd.D., InterMountain Ag. Inc. as a reference.
 3. Growers shall harvest the apple crop and clean up ground-fall apples.
 4. Prunings shall be removed from the orchard and burned or flail-chopped.

6. IMPLEMENTATION

This order shall be implemented on the effective date and remain effective until the rulemaking process to effect these changes are complete.

A Basic Approach to Codling Moth Control

G.T. Bohmfalk Ph. D.
InterMountain Ag. Inc.

Importance: The Codling moth is a primary pest of apples in Southeastern Arizona. It is the most difficult pest to control and when unmanaged, will infest up to 95% of the apples in any given crop year. While damaged fruit may occasionally be sold for processing, worm-damaged apples cannot be sold to the fresh market where real profitability can exist. Consequently the pest can mean the difference between profit and loss. The pest has the ability to destroy the apple driven economy of the area.

The Codling moth (CM) is fairly well understood. It is manageable in the Bonita area when comprehensive control programs are undertaken. Much is known about its life cycle and the various approaches to control.

Nature of the Pest: As mention previously, CM is a primary pest. It requires only the apple crop and is not well controlled by natural enemies because of the nature of its damage. It is a lepidopteran pest and as such passes through 4 well defined life stages.

1 – Egg – The female has the ability to lay up to 50 eggs. They are white, ovoid and flattened horizontally. At about 2 mm. they are hard to find by the layman. The eggs are laid in close proximity to the fruit of the apple tree and require from 6-20 days to hatch (depending on the temperature).

2 – Larvae – The larval stage begins on the plant surfaces and are cuticular feeders until they encounter fruiting forms. There they enter the fruit and bore directly into the center of the apple in an effort to feed on the higher protein seed. The time required for several larval instars is from 18 to 28 days.

3 – Pupae – The pupal stage begins as the mature larvae exit the fruit (although overwintering larvae and pupae may spend the entire winter inside the fruit either on or off the tree). When they leave the fruit they either crawl to protected areas on the tree or drop to the ground where they seek shelter, spin loose cocoons and change into the adults after a short resting period.

4 – Adult – The length of the adult stage is highly variable. Being highly mobile, they can move from one area to another rather easily if need be. They are well camouflaged and are active at night. Fortunately they are easily attracted to traps. The entire life cycle, like that of all animals, is heat driven. An “average” life cycle requires 28 days. There are two to four generations per year.

Degree Day Models

The most successful strategies for controlling CM make use of Degree Day (DD) modeling and pheromone traps. The effective temperatures at which CM develops are between 50F on the low side and 88F on the high side. If the temperature is not in this range development is inhibited. By using sophisticated monitoring equipment degree days can be easily enrolled into a control program simply by understanding and anticipating the various parts of the life cycles.

Conventional Chemical Control

First Generation – The first time to spray with chemicals should be timed so that emerging larvae from the first egg hatch are killed. This occurs in Bonita at between 250 DD's and 400 DD's after primary biofix. Normally one treatment is enough however with populations generally out of control a second may be necessary during this time of the season.

Second Generation – The next time spraying is called for is determined by the secondary biofix which should occur around 1060 DD's after the initial biofix. A normal population would require one treatment at between 200 and 250 DD's after the secondary biofix. If the population is heavy two treatments may be necessary. One at 1060 DD's and the next between the end of the residual of the first and 200 DD's after secondary biofix.

Third Generation – Third generations are common in the Bonita area. In 1997, there were accumulations of over 3000 DD's by September 1st. Again using the second biofix, set the third biofix by accumulation 1100 to 1200 DD's after the second. Then time a chemical spray at the point where 200 to 250 DD's occur after the third biofix. This last spray should do an adequate job however another may be necessary when populations are high and the peak flight period occurs over an extended period of time.

The choice of a chemical should be by the grower with the counsel of an Arizona Department of Agriculture licensed Pest Control Advisor who operates independently and is not influenced by commissions paid by chemical retailers.

Pheromone Traps

There are several suppliers of good pheromone traps. Care should be taken to assure that any pheromones used are the correct type and are fresh. They are by nature volatile and in need of frequent replacement. Proper use of traps is the best way to monitor moth activity. Together with the use of DD modeling, an apple producer can feel comfortable in the assessments of where they are in space and time regarding the life cycle of CM.

Non-Chemical Management

The use of mating disruption has proven very effective in the Bonita area. Only one product has given adequate results. The Isomate C-Plus product at 400 units per acre is reliable when used properly. More sophistication is needed when using pheromone dispensers. They are not useful when used against recommendations or applied too late in the season in an effort to extend their useful life. Additional management is given by judicious use of sulfur and other organically approved materials.

Dormant Oil Treatments

The use of dormant and delayed dormant oil treatments are the most useful of any of the spray approaches. Also, they are generally accepted by organic certifying agencies. They must be done every year in the very early spring or late winter.

Cultural Control

Abandoned orchards are ideal habitat for CM. Population explosions are common from the many abandoned and semi-abandoned orchards in the Bonita area. These must be eliminated. Consideration must be given to other than apple trees as hosts. Asian pears, pears, plums and walnuts are known to be able to sustain populations of CM. Fruit must be removed and destroyed from areas where non-management is practiced. Unpicked pollenizers that have not been pruned must have the fruit destroyed before it can serve as an acceptable host. Orchard floor management must also be practiced. This includes removal of picking boxes from the orchard, cleanup of brush and debris, and removal of old spreaders and other objects which offer protection to pupating CM. Trees which are too tall to be reached with conventional spray machines and pickers should be pruned to a height that can be managed. It is also important to keep the rows pruned to the point that vehicles used for cultivation are easily accessed. No fruit should be allowed to lie on the orchard floor intact or remain on the tree through the winter! A healthy tree has a natural resistance to pest attack. Apple trees need at least 48 acre inches of water annually. Poor watering regimes create stressed plants which favor pest build-up.

Caveats!

Insect control is serious business and is best left to professionals. Chemical company representatives are usually salesmen with PCA credentials. Conflict of interest is common when an employees compensation is dependent on the amount of product sold.

“Wannabee” control measures sold by quasi-legitimate companies are everywhere. Such things as fish oil/seaweed extracts etc. have not been proven effective. Wishing they would work and using them just because they are acceptable to certifying agencies is an exercise in money disposal.

Community approaches work best when dealing with a pest like the Codling moth. Cooperation is essential. Bureaucracies are not the answer to any pest control problem, however, they can assist with support, guidance and enforcement.